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UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/460,898	12/14/1999	NAOKI MATSUOKA	FUJY-16.847	3089

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EXAMINER
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ART UNIT	PAPER NUMBER
2155	

11.

DATE MAILED: 06/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

	Application No.	Applicant(s)
Office Action Summary	09/460,898	MATSUOKA ET AL.
	Examiner	**Art Unit**	
	Christian La Forgia	2155	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>29 April 2003</u> .

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-40</u> is/are pending in the application.

    4a) Of the above claim(s) <u>23</u> is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-22 and 24-40</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>14 December 1999</u> is/are: a)☐ accepted or b)☒ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

    If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All b)☐ Some * c)☐ None of:

      1.☒ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____ .

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

    a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)   4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)   5) ☐ Notice of Informal Patent Application (PTO-152)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .   6) ☐ Other: .

DETAILED ACTION

1.   The amendment filed on 29 April 2003 is noted and made of record.

2.   Claims 1 through 40 are presented for examination.

3.   Claim 23 is cancelled as per Applicant's request.

Drawings

4.   The informal drawings filed in this application are acceptable for examination purposes.

When the application is allowed, applicant will be required to submit new formal drawings.

5.   The Patent and Trademark Office no longer makes drawing changes. See 1017 O.G. 4.

It is applicant's responsibility to ensure that the drawings are corrected. Corrections must be

made in accordance with the instructions below.

INFORMATION ON HOW TO EFFECT DRAWING CHANGES

1.   Correction of Informalities -- 37 CFR 1.85

New corrected drawings must be filed with the changes incorporated therein. Identifying
indicia, if provided, should include the title of the invention, inventor's name, and
application number, or docket number (if any) if an application number has not been
assigned to the application. If this information is provided, it must be placed on the front
of each sheet and centered within the top margin. If corrected drawings are required in a
Notice of Allowability (PTOL-37), the new drawings **MUST** be filed within the **THREE
MONTH** shortened statutory period set for reply in the "Notice of Allowability."
Extensions of time may NOT be obtained under the provisions of 37 CFR 1.136 for filing
the corrected drawings after the mailing of a Notice of Allowability. The drawings
should be filed as a separate paper with a transmittal letter addressed to the Official
Draftsperson.

2.   Corrections other than Informalities Noted by Draftsperson on form PTO-948.

All changes to the drawings, other than informalities noted by the Draftsperson, **MUST**
be made in the same manner as above except that, normally, a highlighted (preferably red
ink) sketch of the changes to be incorporated into the new drawings **MUST** be approved
by the examiner before the application will be allowed. No changes will be permitted to
be made, other than correction of informalities, unless the examiner has approved the
proposed changes.

Timing of Corrections

Applicant is required to submit acceptable corrected drawings within the time period set in the Office action. See 37 CFR 1.185(a). Failure to take corrective action within the set (or extended) period will result in **ABANDONMENT** of the application.

Response to Amendment

6.   The amendment filed 29 April 2003 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: Virtual Output Queue.

7.   Applicant is required to cancel the new matter in the reply to this Office Action.

Response to Arguments

8.   Applicant's arguments with respect to claims 1 through 35 have been considered but are moot in view of the new ground(s) of rejection.

9.   See further rejections that follow.

Claim Rejections - 35 USC § 112

10.   The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

11.   Claims 1 through 22 and 24 through 40 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The specification fails to teach, let alone mention, anything about supporting a virtual output queue.

Claim Rejections - 35 USC § 102

12.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

13.   Claim 17 is rejected under 35 U.S.C. 102(e) as being anticipated by United States Patent No. 6,449,283 to Chao et al., (hereinafter Chao).

14.   As per claim 17, Chao teaches a scheduling control system for a switch having a Virtual Output Queue comprising:

15.   means for notifying a scheduling processing unit of a quality of service class together with forwarding request information (Figure 3a [block 306], 3b [block 328]; column 7, line 65 to column 8, line 9);

16.   a scheduling processing unit for executing a scheduling process based on the forwarding request information on a first priority class of each input line in a first scheduling, and for executing, with an output line being unestablished in the first scheduling, the scheduling based on the request information on a second priority class (Figure 33; column 31, lines 20-48; column 31, line 51 to column 32, line 52),

17.   wherein the scheduling processing unit includes:

18.   a scheduler for performing the scheduling from a higher priority class among two or more

classes (Figure 33; column 31, lines 20-48; column 31, line 51 to column 32, line 52); and

19.   a buffer for executing band control of the output line determined by the scheduler and

intra-group band control (column 9, line 52 to column 10, line 26; column 10, line 52 to column

11, line 23; column 20, lines 21-63).

Claim Rejections - 35 USC § 103

20.   Claims 1 through 16, 17 through 22, and 24 through 40 are rejected under 35

U.S.C. 103(a) as being unpatentable over Chao, in view of United States Patent No. 6,262,986 to

Oba et al., (hereinafter Oba).

21.   As per claim 1, Chao teaches a scheduling control system for a switch having a Virtual

Output Queue comprising:

22.   a request information management unit managing the number of scheduling request and

holding forwarding request information of each input line as a scheduling target with respect to a

desired output line (Figures 7a [block 714], 7b [block 714'], 8 [block 810, 840], 10 [blocks 1010,

1020, 1030, 1040], 11, 12 [blocks 1250, 1260, 1262, 1270], 13 [block 1270'], 15 [block 1520],

16 [blocks 1630, 1640], 17, 20a, 20b, 28, 37a, 37b, 37c; column 7, lines 33-44; column 8, lines

10-47; column 10, lines 27-50; column 12, lines 38-51; column 17, lines 22-29);

23.   an inter-highway pointer control unit for indicating a start of scheduling input line

(Figures 8, 9, 10 [blocks 1010, 1020, 1030, 1040], 11, 16 [blocks 1630, 1640], 17, 28, 33, 35a,

35b, 35c, 35d, 35e, 37c; column 8, line 48 to column 9, line 51; column 10, line 52 to column 11,

line 47; column 16, lines 3-59; column 19, line 17 to column 20, line 20);

24.   an intra-highway pointer control unit for indicating a start of retrieval output line in the

forwarding request information corresponding to each input line (Figures 8, 9, 10 [blocks 1010,

1020, 1030, 1040], 11, 16 [blocks 1630, 1640], 17, 28, 33, 35a, 35b, 35c, 35d, 35e, 37c; column

8, line 48 to column 9, line 51; column 10, line 52 to column 11, line 47; column 16, lines 3-59;

column 19, line 17 to column 20, line 20).

25.   Chao does not teach a scheduling processing unit for starting the retrieval of the output

lines from the output line indicated by the intra-highway pointer control unit according to the

forwarding request information, selecting the output line unselected by other input lines,

performing the scheduling for all the input lines in sequence starting from the input line indicated

by the inter-highway pointer control unit, and updating each start-of-retrieval output line

indicated by the intra-highway pointer control unit at a next scheduling cycle.

26.   Oba teaches a scheduling processing unit for starting the retrieval of the output lines from

the output line indicated by the intra-highway pointer control unit according to the forwarding

request information, selecting the output line unselected by other input lines, performing the

scheduling for all the input lines in sequence starting from the input line indicated by the inter-

highway pointer control unit, and updating each start-of-retrieval output line indicated by the

intra-highway pointer control unit at a next scheduling cycle (Figures 1 [block 16], 2 [block 16],

3, 4, 5a [block 16], 5b [block 16], 8a-d [block 16], 10 [blocks 11-1, 11-2, 11-N], 13; column 4,

line 62 to column 6, line 53; column 7, line 1 to column 10, line 3). Therefore it would have

been obvious to one of ordinary skill in the art at the time the invention was made to include the

scheduling processing unit of Oba with the system of Chao, as it would create a system in which

all packets were dealt with fairly. One would be motivated to combine such a scheduling unit in

the system of Chao as it would ensure that the use of bandwidth was being maximized as well as

creating a method in which delivery was ensured via quality of service techniques as discussed

both in Chao and Oba.

27.   Regarding claim 2, Chao teaches a scheduling control system for a switch having a

Virtual Output Queue comprising:

28.   a request information management unit managing the number of scheduling requests and

holding forwarding request information of each input line as a scheduling target with respect to a

desired output line (Figures 7a [block 714], 7b [block 714'], 8 [block 810, 840], 10 [blocks 1010,

1020, 1030, 1040], 11, 12 [blocks 1250, 1260, 1262, 1270], 13 [block 1270'], 15 [block 1520],

16 [blocks 1630, 1640], 17, 20a, 20b, 28, 37a, 37b, 37c; column 7, lines 33-44; column 8, lines

10-47; column 10, lines 27-50; column 12, lines 38-51; column 17, lines 22-29);

29.   an inter-highway pointer control unit for indicating a start-of-scheduling output line

(Figures 8, 9, 10 [blocks 1010, 1020, 1030, 1040], 11, 16 [blocks 1630, 1640], 17, 28, 33, 35a,

35b, 35c, 35d, 35e, 37c; column 8, line 48 to column 9, line 51; column 10, line 52 to column 11,

line 47; column 16, lines 3-59; column 19, line 17 to column 20, line 20);

30.   an intra-highway pointer control unit for indicating a start-of-retrieval input line in the

forwarding request information corresponding to each input line (Figures 8, 9, 10 [blocks 1010,

1020, 1030, 1040], 11, 16 [blocks 1630, 1640], 17, 28, 33, 35a, 35b, 35c, 35d, 35e, 37c; column

8, line 48 to column 9, line 51; column 10, line 52 to column 11, line 47; column 16, lines 3-59;

column 19, line 17 to column 20, line 20); and,

31.   a scheduling processing unit for starting the retrieval of the input lines from the input line

indicated by the intra-highway pointer control unit according to the forwarding request

information, selecting the input line that is not ensured by other output lines, performing the

scheduling for all the output lines in sequence starting from the output line indicated by the inter-

highway pointer control unit, and updating each start-of-retrieval input line indicated by the

intra-highway pointer control unit at a next scheduling cycle (Figures 8, 9, 10 [blocks 1010,

1020, 1030, 1040], 11, 16 [blocks 1630, 1640], 17, 28, 33, 35a, 35b, 35c, 35d, 35e, 37c; column

9, line 52 to column 10, line 27; column 10, line 52 to column 11, line 47; column 15, line 65 to

column 16, line 59; column 20, lines 21-38).

32.   With regards to claim 3, Chao teaches the scheduling processing unit updates an inter-

highway pointer to a next adjacent line per scheduling cycle, and updates an intra-highway

pointer to a next line adjacent to the line with forwarding determined (Figures 10, 12, 13 [block

1270'], 19; column 12, lines 38-52; column 15, line 65 to column 16, line 53; column 17, line 66

to column 18, line 60; column 21, lines 49-65).

33.   As per claim 4, Chao teaches the scheduling processing unit updates an inter-highway

pointer to a line next to the line with the forwarding established at first within the scheduling

cycle, and updates an intra-highway pointer to a next line adjacent to the line with the forwarding

determined (Figures 10, 12, 13 [block 1270'], 19; column 12, lines 38-52; column 15, line 65 to

column 16, line 53; column 17, line 66 to column 18, line 60; column 21, lines 49-65).

34.   Regarding claim 5, Chao teaches the scheduling processing unit, if the request

information exists in the line indicted by the intra-highway pointer and this line is used by other

lines, does not update the intra-highway pointer (Figures 10, 12, 13 [block 1270'], 19; column

12, lines 38-52; column 15, line 65 to column 16, line 53; column 17, line 66 to column 18, line

60; column 21, lines 49-65).

35.   Concerning claim 6, Chao teaches a scheduling control system for a switch having a

Virtual Output Queue comprising:

36.   a request information management unit managing the number of scheduling requests and

holding forwarding request information on each input line as a scheduling target with respect to a

desired output line (Figures 7a [block 714], 7b [block 714'], 8 [block 810, 840], 10 [blocks 1010,

1020, 1030, 1040], 11, 12 [blocks 1250, 1260, 1262, 1270], 13 [block 1270'], 15 [block 1520],

16 [blocks 1630, 1640], 17, 20a, 20b, 28, 37a, 37b, 37c; column 7, lines 33-44; column 8, lines

10-47; column 10, lines 27-50; column 12, lines 38-51; column 17, lines 22-29);

37.   an inter-highway pointer control unit for holding an inter-highway pointer for indicating a

start-of-scheduling input line (Figures 10, 12, 13 [block 1270'], 19; column 12, lines 38-52;

column 15, line 65 to column 16, line 53; column 17, line 66 to column 18, line 60; column 21,

lines 49-65);

38.   an intra-highway pointer control unit for holding an intra-highway pointer for indicating a

start-of-retrieval output line in the forwarding request information corresponding to each input

line (Figures 10, 12, 15 [block 1520]; column 9, line 52 to column 10, line 27; column 16, lines

3-59);

39.   a request management control unit for holding forwarding request information to a

desired output line (Figures 10, 12, 15 [block 1520]; column 9, line 52 to column 10, line 27;

column 16, lines 3-59); and,

40.   Chao does not teach a scheduling processing unit for starting the retrieval of the output

lines from the output line indicated by the intra-highway pointer control unit based upon plural

pieces of the forwarding request information, and selecting the output line unselected by other

input lines, and after finishing the scheduling, updating the inter-highway pointer to an adjacent

line by alternately executing between a process of updating to an adjacent line in a forward

direction per scheduling cycle, and a process of updating to an adjacent line in a reverse

direction.

41.   Oba teaches a scheduling processing unit for starting the retrieval of the output lines from

the output line indicated by the intra-highway pointer control unit based upon plural pieces of the

forwarding request information, and selecting the output line unselected by other input lines, and

after finishing the scheduling, updating the inter-highway pointer to an adjacent line by

alternately executing between a process of updating to an adjacent line in a forward direction per

scheduling cycle, and a process of updating to an adjacent line in a reverse direction (Figures 1

[block 16], 2 [block 16], 3, 4, 5a [block 16], 5b [block 16], 8a-d [block 16], 10 [blocks 11-1, 11-

2, 11-N], 13; column 4, line 62 to column 6, line 53; column 7, line 1 to column 10, line 3).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention

was made to include the scheduling processing unit of Oba with the system of Chao, as it would

create a system in which all packets were dealt with fairly. One would be motivated to combine

such a scheduling unit in the system of Chao as it would ensure that the use of bandwidth was

being maximized as well as creating a method in which delivery was ensured via quality of

service techniques as discussed both in Chao and Oba.

42.   As per claim 7, Chao teaches the scheduling processing unit includes:

43.   means for dividing, when selecting the forwarding request information corresponding to

each line as a scheduling target, the forwarding request information into two pieces of

information before and after the intra-highway pointer, and obtaining the lines having lowest

numbers based on a low number selection logic from those pieces of information (Figures 10, 11,

13 [block 1320, 1330, 1350]; column 18, lines 27-60); and,

44.   means for obtaining a final forwarding line number from the obtained two lower number

lines with a priority given to a result after the intra-highway pointer (Figure 33; column 31, lines

20-48; column 31, line 51 to column 32, line 52).

45.   As per claim 8, Chao the scheduling processing units are provided, and the scheduling

control system further comprises pipeline processing means for each independently executing

pipeline process (Figure 13 [block 1320, 1330, 1350]; column 18, lines 27-60).

46.   As per claim 9, Chao teaches a scheduling control system for a switch having a Virtual

Output Queue comprising:

47.   a request information management unit managing the number of scheduling requests and

holding forwarding request information on each input line as a scheduling target with respect to a

desired output line (Figures 7a [block 714], 7b [block 714'], 8 [block 810, 840], 10 [blocks 1010,

1020, 1030, 1040], 11, 12 [blocks 1250, 1260, 1262, 1270], 13 [block 1270'], 15 [block 1520],

16 [blocks 1630, 1640], 17, 20a, 20b, 28, 37a, 37b, 37c; column 7, lines 33-44; column 8, lines

10-47; column 10, lines 27-50; column 12, lines 38-51; column 17, lines 22-29);

48.   an inter-highway pointer control unit for holding an inter-highway pointer for indicating a

start-of-scheduling input line (Figures 10, 12, 13 [block 1270'], 19; column 12, lines 38-52;

column 15, line 65 to column 16, line 53; column 17, line 66 to column 18, line 60; column 21,

lines 49-65);

49.   an intra-highway pointer control unit for holding an intra-highway pointer for indicating a

start-of-retrieval output line in the forwarding request information corresponding to each input

line (Figures 10, 12, 15 [block 1520]; column 9, line 52 to column 10, line 27; column 16, lines

3-59);

50.   a request management control unit for holding forwarding request information to a

desired output line (Figures 10, 12, 15 [block 1520]; column 9, line 52 to column 10, line 27;

column 16, lines 3-59); and,

51.   the intra-highway pointer control unit is independently controlled per the pipeline

processing means (Figure 13 [block 1320, 1330, 1350]; column 18, lines 27-60).

52.   Chao does not teach a plurality of scheduling processing units for starting the retrieval of

the output lines from the output line indicated by the intra-highway pointer control unit from

plural pieces of the forwarding request information, and selecting the output line unselected by

other input lines;

53.   wherein the plurality of scheduling processing units further include a plurality of pipeline

processing means having inter-highway pointer with different start-of-scheduling line numbers

and each independently executing a pipeline process.

54.   Oba teaches a plurality of scheduling processing units for starting the retrieval of the

output lines from the output line indicated by the intra-highway pointer control unit from plural

pieces of the forwarding request information, and selecting the output line unselected by other

input lines (Figures 1 [block 16], 2 [block 16], 3, 4, 5a [block 16], 5b [block 16], 8a-d [block 16],

10 [blocks 11-1, 11-2, 11-N], 13; column 4, line 62 to column 6, line 53; column 7, line 1 to

column 10, line 3);

55.   wherein the plurality of scheduling processing units further include a plurality of pipeline

processing means having inter-highway pointer with different start-of-scheduling line numbers

and each independently executing a pipeline process (Figures 1 [block 16], 2 [block 16], 3, 4, 5a

[block 16], 5b [block 16], 8a-d [block 16], 10 [blocks 11-1, 11-2, 11-N], 13; column 4, line 62 to

column 6, line 53; column 7, line 1 to column 10, line 3).

56.   Therefore it would have been obvious to one of ordinary skill in the art at the time the

invention was made to include the scheduling processing unit of Oba with the system of Chao, as

it would create a system in which all packets were dealt with fairly. One would be motivated to

combine such a scheduling unit in the system of Chao as it would ensure that the use of

bandwidth was being maximized as well as creating a method in which delivery was ensured via

quality of service techniques as discussed both in Chao and Oba. Additionally, one would also

be motivated to implement multiple scheduling processing units as it would increase the speed

and reliability of the switch, two areas that are of the utmost importance in networking. See *In re Harza*, 274 F.2d 669, 671, 124 USPQ 378, 380 (CCPA 1960).

57.   As per claim 10, Chao teaches a scheduling control system comprising:

58.   a request information management unit for holding forwarding request information on each input line as a scheduling target with respect to a desired output line (Figures 7a [block 714], 7b [block 714'], 8 [block 810, 840], 10 [blocks 1010, 1020, 1030, 1040], 11, 12 [blocks 1250, 1260, 1262, 1270], 13 [block 1270'], 15 [block 1520], 16 [blocks 1630, 1640], 17, 20a, 20b, 28, 37a, 37b, 37c; column 7, lines 33-44; column 8, lines 10-47; column 10, lines 27-50; column 12, lines 38-51; column 17, lines 22-29);

59.   an inter-highway pointer control unit for holding an inter-highway pointer for indicating a start-of-scheduling input line (Figures 10, 12, 13 [block 1270'], 19; column 12, lines 38-52; column 15, line 65 to column 16, line 53; column 17, line 66 to column 18, line 60; column 21, lines 49-65);

60.   an intra-highway pointer control unit for holding an intra-highway pointer for indicating a start-of-retrieval output line in the forwarding request information corresponding to each input line (Figures 10, 12, 15 [block 1520]; column 9, line 52 to column 10, line 27; column 16, lines 3-59);

61.   a request management control unit for holding forwarding request information to a desired output line (Figures 10, 12, 15 [block 1520]; column 9, line 52 to column 10, line 27; column 16, lines 3-59); and,

62.   Chao does not teach a scheduling processing unit for starting the retrieval of the output

lines from the output line indicated by the intra-highway pointer control unit from plural pieces

of the forwarding request information, and selecting the output line unselected by other input

lines,

63.   wherein the scheduling processing unit further includes a load observing unit for counting

the number of packets arrived within a fixed cycle per logical forwarding request information of

each input line, and performs the scheduling of a next cycle in accordance with the number of

packets counted by the load observing unit.

64.   Oba teaches a scheduling processing unit for starting the retrieval of the output lines from

the output line indicated by the intra-highway pointer control unit from plural pieces of the

forwarding request information, and selecting the output line unselected by other input lines

(Figures 1 [block 16], 2 [block 16], 3, 4, 5a [block 16], 5b [block 16], 8a-d [block 16], 10 [blocks

11-1, 11-2, 11-N], 13; column 4, line 62 to column 6, line 53; column 7, line 1 to column 10, line

3),

65.   wherein the scheduling processing unit further includes a load observing unit for counting

the number of packets arrived within a fixed cycle per logical forwarding request information of

each input line, and performs the scheduling of a next cycle in accordance with the number of

packets counted by the load observing unit (Figures 1 [block 16], 2 [block 16], 3, 4, 5a [block

16], 5b [block 16], 8a-d [block 16], 10 [blocks 11-1, 11-2, 11-N], 13; column 4, line 62 to

column 6, line 53; column 7, line 49 to column 8, line 29; column 12, line 44 to column 13, line

25).   It would have been obvious to one of ordinary skill in the art at the time the invention was

made to include the scheduling processing unit of Oba with the system of Chao, as it would

create a system in which all packets were dealt with fairly. One would be motivated to combine

such a scheduling unit in the system of Chao as it would ensure that the use of bandwidth was

being maximized as well as creating a method in which delivery was ensured via quality of

service techniques as discussed both in Chao and Oba.

66.   Regarding claim 11, Chao teaches the scheduling processing unit restricts the number of

forwarding permission packets to each output line within the fixed cycle, to the number of

arrived packets to each piece of logical forwarding request information at the previous cycle

(Figures 5, 8, 14e, 16, & 22a; column 20, lines 1-18; column 21, lines 28-49).

67.   Concerning claim 12, Chao teaches the scheduling processing unit determines a rate for

attaining a top priority output line in the scheduling within the fixed cycle in accordance with the

number of arrived packets at the previous cycle (Figure 33; column 31, lines 20-48; column 31,

line 51 to column 32, line 52).

68.   With regards to claim 13, Chao teaches the scheduling processing unit holds a top

priority forwarding pointer, other than the intra-highway pointer, for determining the line for

forwarding with a top priority in accordance with the number of arrived packets at the previous

cycle, determines the output line in accordance with a rate of the number of arrived packets to

each piece of the forwarding request information in accordance with the top priority forwarding

pointer with respect to the number of all the arrived packets arrived at the input line at the

previous cycle, and executes the scheduling with respect to those excluding the number of all the

arrived packets in accordance with the normal intra-highway pointer (Figures 5, 8, 14e, 16, 22a,

& 33; column 20, lines 1-18; column 21, lines 28-49; column 31, lines 20-48; column 31, line 51

to column 32, line 52).

69.   As per claim 14, Chao teaches the scheduling processing unit executes, if the packets, of

which the number is the same as the number of arrived packets at the previous cycle, are not

forwarded within a present cycle, a process of carrying over a remaining number of arrived

packets to the number of arrived packets at a next cycle (Figure 13 [blocks 1320, 1350, 1370],

36a, 36b, 36c; column 18, line 28 to column 19, line 12; column 31, line 51 to column 32, line

33).

70.   Regarding claim 15, Chao teaches the scheduling processing unit determines a rate for

attaining a top priority output line in the scheduling within a fixed cycle in accordance with a

forwarding request information length at the previous cycle (Figure 33; column 31, lines 20-48;

column 31, line 51 to column 32, line 52).

71.   With regards to claim 16, Chao teaches wherein there are constructed extension units

each including the scheduling processing unit per input line, two pieces of I/O ports, a selector

unit for switching over an external I/O and an internal ring-connection, and a delay unit capable

of changing a forwarding delay quantity to an extension output (Figures 8, 9, 12, 13 [blocks

1270', 1310, 1340, 1360], 14a-e, 22a-b, 32, 35a-e, 36a-c, 37a-c; column 12, line 52 to column

13, line 13; column 26, lines 22-38), and,

72.   the extension units are ring-connected (Figures 22a-b; column 12, line 52 to column 13,

line 13; column 26, lines 22-38).

73.   As per claim 18, Chao does not teach a scheduling control system, wherein the

scheduling processing unit further includes notifying means for notifying the buffer of a result of

scheduling after the scheduling with respect to the first priority class and a buffer band control

unit for controlling the band of the Quality of Service class within the line determined by the

scheduler and performing delay priority control,

74.   the buffer, if within a predetermined band of the Quality of Service class, accepts a result

given from the scheduler and forwards data accumulated in the buffer, and, if out of the band,

makes the forwarding request information thereof invalid and notifies the scheduler of this

purport, and,

75.   the scheduling processing unit thus performs a second scheduling.

76.   Oba teaches a scheduling control system, wherein the scheduling processing unit further

includes notifying means for notifying the buffer of a result of scheduling after the scheduling

with respect to the first priority class and a buffer band control unit for controlling the band of

the Quality of Service class within the line determined by the scheduler and performing delay

priority control (Figures 7, 8A, 8B, 8C, & 8D; column 1, lines 19-55; column 11, line 22 to

column 12, line 3;column 12, line 44 to column 13, line 25),

77.   the buffer, if within a predetermined band of the Quality of Service class, accepts a result

given from the scheduler and forwards data accumulated in the buffer, and, if out of the band,

makes the forwarding request information thereof invalid and notifies the scheduler of this

purport (Figures 7, 8A, 8B, 8C, & 8D; column 11, line 22 to column 12, line 3;column 12, line

44 to column 13, line 25), and,

78.   the scheduling processing unit thus performs a second scheduling (Figures 7, 8A, 8B, 8C,

& 8D; column 11, line 22 to column 12, line 3;column 12, line 44 to column 13, line 25). It

would have been obvious to one of ordinary skill in the art to include the Quality of Service of

Oba with the system of Chao because it would enable a system in which packets were guaranteed

delivery. One would be motivated to include a quality of service system in that of the

aforementioned system because it would create a method of checking the efficiency and

reliability of the switch.

79.   Regarding claim 19, Chao teaches a switch having a Virtual Output Queue comprising:

80.   an input buffer for controlling a band of the output line determined by the scheduler

(column 10, line 51 to column 11, line 65; column 19, line 16 to column 20, line 20; column 21,

line 49 to column 22, line 2);

81.   a band control unit for executing delay and band control of each quality of service class

in the output line having a forwarding right determined in the scheduling processing unit, reading

packet-formatted data from the buffer if within a predetermined band, and, if out of the

predetermined band, notifying the scheduler of a purport that the forwarding request information

is invalid without outputting the packet-formatted data from the buffer (Figures 8, 9, 10 [blocks

1010, 1020, 1030, 1040], 11, 16 [blocks 1630, 1640], 17, 28, 33, 35a, 35b, 35c, 35d, 35e, 37c;

column 9, line 52 to column 10, line 27; column 10, line 52 to column 11, line 47; column 15,

line 65 to column 16, line 59; column 20, lines 21-38).

82.   Chao does not teach means for notifying a scheduling processing unit of a quality of

service class together with forwarding request information;

83.   a scheduling processing unit having a scheduler for executing scheduling in order to

determine an output line based on the forwarding request information.

84.   Oba teaches means for notifying a scheduling processing unit of a quality of service class

together with forwarding request information (Figures 1 [block 16], 2 [block 16], 3, 4, 5a [block

16], 5b [block 16], 8a-d [block 16], 10 [blocks 11-1, 11-2, 11-N], 13; column 4, line 62 to

column 6, line 53; column 7, line 49 to column 8, line 29; column 12, line 44 to column 13, line

25);

85.   a scheduling processing unit having a scheduler for executing scheduling in order to

determine an output line based on the forwarding request information (Figures 1 [block 16], 2

[block 16], 3, 4, 5a [block 16], 5b [block 16], 8a-d [block 16], 10 [blocks 11-1, 11-2, 11-N], 13;

column 4, line 62 to column 6, line 53; column 7, line 49 to column 8, line 29; column 12, line

44 to column 13, line 25).   It would have been obvious to one of ordinary skill in the art at the

time the invention was made to include the scheduling processing unit of Oba with the system of

Chao, as it would create a system in which all packets were dealt with fairly. One would be

motivated to combine such a scheduling unit in the system of Chao as it would ensure that the

use of bandwidth was being maximized as well as creating a method in which delivery was

ensured via quality of service techniques as discussed both in Chao and Oba.

86.   As per claim 20, Chao teaches a packet device with a Virtual Output Queue comprising:

87.   means for notifying a scheduling processing unit of a quality of service class together

with forwarding request information (Figure 3a [block 306], 3b [block 328]; column 7, line 65 to

column 8, line 9);

88.   a scheduling processing unit for executing a scheduling process based on the forwarding

request information on a first priority class of each input line in a first scheduling, and for

executing, with an output line being unestablished in the first scheduling, the scheduling based

on the request information on a second priority class (Figure 33; column 31, lines 20-48; column

31, line 51 to column 32, line 52),

89.   wherein the scheduling processing unit includes:

       a scheduler for executing scheduling in an order to determine an output line based

       on the forwarding request information and performing the scheduling from a higher

       priority class among two or more classes (Figure 33; column 31, lines 20-48; column 31,

       line 51 to column 32, line 52); and,

       a buffer for controlling a band of the output line determined by the scheduler and

       intra-group band control (column 18, line 27 to column 20, line 38);

90.   Chao does not teach wherein the scheduling processing unit further includes notifying

means for notifying the buffer of a result of scheduling after the scheduling with respect to the

first priority class and a buffer band control unit for controlling the band of the QoS class within

the line determined by the scheduler and performing delay priority control;

91.   the buffer, if within a predetermined band of the QoS class, accepts a result given from

the scheduler and forwards data accumulated in the buffer, and, if out of band, makes the

forwarding request information thereof invalid and notifies the scheduler of this purport, and

92.   the scheduling processing unit thus performs a second scheduling.

93.   Oba teaches wherein the scheduling processing unit further includes notifying means for

notifying the buffer of a result of scheduling after the scheduling with respect to the first priority

class and a buffer band control unit for controlling the band of the QoS class within the line

determined by the scheduler and performing delay priority control (Figures 3, 7, 8A, 8B, 8C, &

8D; column 7, line 49 to column 8, line 29; column 11, line 22 to column 12, line 3;column 12,

line 44 to column 13, line 25);

94.   the buffer, if within a predetermined band of the QoS class, accepts a result given from

the scheduler and forwards data accumulated in the buffer, and, if out of band, makes the

forwarding request information thereof invalid and notifies the scheduler of this purport (Figures

3, 7, 8A, 8B, 8C, & 8D; column 7, line 49 to column 8, line 29; column 11, line 22 to column 12,

line 3;column 12, line 44 to column 13, line 25), and

95.   the scheduling processing unit thus performs a second scheduling (Figures 7, 8A, 8B, 8C,

& 8D; column 11, line 22 to column 12, line 3;column 12, line 44 to column 13, line 25). It

would have been obvious to one of ordinary skill in the art to include the Quality of Service of

Oba with the system of Chao because it would enable a system in which packets were guaranteed

delivery. One would be motivated to include a quality of service system in that of the

aforementioned system because it would create a method of checking the efficiency and

reliability of the switch.

96.   Regarding claim 21, Oba teaches wherein the scheduling processing unit gives a

forwarding right to the forwarding request in an arbitrary off-band quality of service class if

unable to obtain the forwarding right in any quality of service classes under the band control

(Figures 3, 7, 8A, 8B, 8C, & 8D; column 7, line 49 to column 8, line 29; column 11, line 22 to

column 12, line 3;column 12, line 44 to column 13, line 25).

97.   With regards to claim 22, Chao teaches a switch having a Virtual Output Queue

comprising:

98.   a buffer, divided in logical output routes, for controlling a band of the output line

determined by the scheduler (column 10, line 51 to column 11, line 65; column 19, line 16 to

column 20, line 20; column 21, line 49 to column 22, line 2);

99.   Oba teaches an individual counter, provided per line or per quality of service class, for

counting leaky buckets with respect to the output line selected by the scheduler (column 11, lines

26-58); and,

100.   a representative counter, provided per line, including an internal timer and for counting

an elapsed time since the output line has been selected last time (column 11, lines 26-58),

101.   wherein each representative counter holds a time when the selection of the last time is

made on the basis of the internal timer, and obtains the elapsed time by making a comparison

with a present time when the selection is made next time (column 11, lines 26-58);

102.   means for notifying a scheduling processing unit of a quality of service class together

with forwarding request information (Figures 1 [block 16], 2 [block 16], 3, 4, 5a [block 16], 5b

[block 16], 8a-d [block 16], 10 [blocks 11-1, 11-2, 11-N], 13; column 4, line 62 to column 6, line

53; column 7, line 49 to column 8, line 29; column 12, line 44 to column 13, line 25);

103.   a scheduling processing unit having a scheduler for executing scheduling in order to determine an output line based on the forwarding request information (Figures 1 [block 16], 2 [block 16], 3, 4, 5a [block 16], 5b [block 16], 8a-d [block 16], 10 [blocks 11-1, 11-2, 11-N], 13; column 4, line 62 to column 6, line 53; column 7, line 49 to column 8, line 29; column 12, line 44 to column 13, line 25). It would have been obvious to one of ordinary skill in the art to include the Quality of Service of Oba with the system of Chao because it would enable a system in which packets were guaranteed delivery. One would be motivated to include a quality of service system in that of the aforementioned system because it would create a method of checking the efficiency and reliability of the switch.

104.   As per claim 24, Chao teaches a scheduling control system for a switch having a Virtual Output Queue comprising:

105.   a request information management unit managing the number of scheduling requests and holding forwarding request information on each input line as a scheduling target with respect to a desired output line (Figures 7a [block 714], 7b [block 714'], 8 [block 810, 840], 10 [blocks 1010, 1020, 1030, 1040], 11, 12 [blocks 1250, 1260, 1262, 1270], 13 [block 1270'], 15 [block 1520], 16 [blocks 1630, 1640], 17, 20a, 20b, 28, 37a, 37b, 37c; column 7, lines 33-44; column 8, lines 10-47; column 10, lines 27-50; column 12, lines 38-51; column 17, lines 22-29);

106.   a priority pointer control unit for indicating a start number of the priority patterns (Figure 33; column 31, lines 20-48; column 31, line 51 to column 32, line 52),

107.   wherein the scheduling processing unit sequentially performs the scheduling for the N-patterns from the priority pattern indicated by a priority pointer, and updates the start number of

the priority patterns at a next scheduling cycle (Figure 33; column 31, lines 20-48; column 31, line 51 to column 32, line 52).

108.   Chao does not teach a scheduling processing unit, having N-pieces (N is a natural number equal to or more than 2) of priority patterns with different selection priorities between the respective output lines, for selecting the output line unused by other input lines in accordance the priority pattern and the forwarding request information.

109.   Oba teaches a scheduling processing unit, having N-pieces (N is a natural number equal to or more than 2) of priority patterns with different selection priorities between the respective output lines, for selecting the output line unused by other input lines in accordance the priority pattern and the forwarding request information (Figures 1 [block 16], 2 [block 16], 3, 4, 5a [block 16], 5b [block 16], 8a-d [block 16], 10 [blocks 11-1, 11-2, 11-N], 13; column 4, line 62 to column 6, line 53; column 7, line 49 to column 8, line 29; column 12, line 44 to column 13, line 25).   It would have been obvious to one of ordinary skill in the art at the time the invention was made to include the scheduling processing unit of Oba with the system of Chao, as it would create a system in which all packets were dealt with fairly. One would be motivated to combine such a scheduling unit in the system of Chao as it would ensure that the use of bandwidth was being maximized as well as creating a method in which delivery was ensured via quality of service techniques as discussed both in Chao and Oba.

110.   As per claim 25, Chao teaches a scheduling control system for a switch having a Virtual Output Queue comprising:

111.   a request information management unit managing the number of scheduling requests and

holding forwarding request information on each input line as a scheduling target with respect to a

desired output line (Figures 7a [block 714], 7b [block 714'], 8 [block 810, 840], 10 [blocks 1010,

1020, 1030, 1040], 11, 12 [blocks 1250, 1260, 1262, 1270], 13 [block 1270'], 15 [block 1520],

16 [blocks 1630, 1640], 17, 20a, 20b, 28, 37a, 37b, 37c; column 7, lines 33-44; column 8, lines

10-47; column 10, lines 27-50; column 12, lines 38-51; column 17, lines 22-29);

112.   a priority pointer control unit for indicating a start number of the priority patterns (Figure

33; column 31, lines 20-48; column 31, line 51 to column 32, line 52),

113.   wherein the scheduling processing unit sequentially performs the scheduling for the N-

patterns from the priority pattern indicated by a priority pointer, and updates the start number of

the priority patterns at a next scheduling cycle (Figure 33; column 21, lines 22-48; column 30,

lines 19-56; column 31, lines 20-48; column 31, line 51 to column 32, line 52).

114.   Chao does not teach a scheduling processing unit, having N-pieces (N is a natural number

equal to or more than 2) of priority patterns with different selection priorities between the

respective output lines, for selecting the output line unused by other input lines in accordance the

priority pattern and the forwarding request information.

115.   Oba teaches a scheduling processing unit, having N-pieces (N is a natural number equal

to or more than 2) of priority patterns with different selection priorities between the respective

output lines, for selecting the output line unused by other input lines in accordance the priority

pattern and the forwarding request information (Figures 1 [block 16], 2 [block 16], 3, 4, 5a

[block 16], 5b [block 16], 8a-d [block 16], 10 [blocks 11-1, 11-2, 11-N], 13; column 4, line 62 to

column 6, line 53; column 7, line 49 to column 8, line 29; column 12, line 44 to column 13, line

25). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include the scheduling processing unit of Oba with the system of Chao, as it would create a system in which all packets were dealt with fairly. One would be motivated to combine such a scheduling unit in the system of Chao as it would ensure that the use of bandwidth was being maximized as well as creating a method in which delivery was ensured via quality of service techniques as discussed both in Chao and Oba.

116. Regarding claim 26, Chao does not teach wherein the scheduling processing unit applies a random array of inverted LSB/MSB binary notation permutation layout patterns as the above priority patterns.

117. Oba teaches wherein the scheduling processing unit applies a random array of inverted LSB/MSB binary notation permutation layout patterns as the above priority patterns (Figures 7, 8A, 8B, 8C, & 8D; column 11, line 22 to column 12, line 3; column 12, line 44 to column 13, line 25). It would have been obvious to one of ordinary skill of the art at the time the invention was made to invert the binary notation of Oba as simply reversing or rearranging parts. See *In re Japikse*, 181 F.2d 1019, 1023, 86 USPQ 70, 73 (CCPA 1950).

118. With regards to claim 27, Chao teaches the scheduling processing unit includes means for selecting the forwarding line in accordance with the priority indicated by the priority pattern, and means for making a rotation of a combination of input line numbers and output line numbers which are different between the respective lines at every scheduling cycle (Figure 33; column 31, lines 20-48; column 31, line 51 to column 32, line 52).

119.   As per claim 28, Chao teaches the scheduling processing unit includes a scheduler for

determining a selection candidate within a small group having a plurality of priority patterns with

different selection priorities between all the lines, and an arrangement scheduler for arranging the

candidates selected by the scheduler in accordance with the priorities between all the lines, and

determining the final line (Figure 33; column 31, lines 20-48; column 31, line 51 to column 32,

line 52).

120.   As per claim 29, Chao teaches a packet switch having a Virtual Output Queue

comprising:

121.   sorters each serving as a unit sorter for sorting input cells coming from m-lines of input

routes and transferring the sorted input cells to m-lines of output routes, the packet switch being

constructed by connecting the unit sorters at multi-stages (Figures 18 & 32; column 20, line 38 to

column 21, line 49; column 24, lines 7-48; column 24, line 64 to 26, line 20; column 28, lines 1-

23),

122.   wherein outputs per the unit sorter of a first-stage unit sorter group are outputted

separately to a dummy sorter provided at a second stage and the unit sorter at the second stage

(Figures 18 & 32; column 20, line 38 to column 21, line 49; column 24, lines 7-48; column 24,

line 64 to 26, line 20; column 28, lines 1-23), and,

123.   outputs of the second-stage dummy sorter and of the second-stage unit sorter are inputted

to a third-stage unit sorter group (Figures 18 & 32; column 20, line 38 to column 21, line 49;

column 24, lines 7-48; column 24, line 64 to 26, line 20; column 28, lines 1-23).

N-input/N-output sorter network is configured on the whole by connecting (2N/m-1)* N/m

pieces of the unit sorters (Figures 18 & 32; column 20, line 38 to column 21, line 49; column 24,

lines 7-48; column 24, line 64 to 26, line 20; column 28, lines 1-23). See MPEP 716.01(a)

concerning (2N/m-1)* N/m.

124.   Regarding claim 30, Chao teaches a packet having a Virtual Output Queue comprising:

125.   sorters each serving as a unit sorter for sorting input cells coming from m-lines of input

routes and transferring the sorted input cells to N-lines of output routes, the packet switch being

constructed by connecting the unit sorters at multi-stages in matrix X- and Y-directions (Figures

18 & 32; column 20, line 38 to column 21, line 49; column 24, lines 7-48; column 24, line 64 to

26, line 20; column 28, lines 1-23);

126.   wherein outputs of the respective unit sorters are inputted to next-stage unit sorters

positioned in (+)X- and (-)Y-directions of the unit sorter (Figures 18 & 32; column 20, line 38 to

column 21, line 49; column 24, lines 7-48; column 24, line 64 to 26, line 20; column 28, lines 1-

23),

127.   when extending the sorter group, the outputs of the respective unit sorters are inputted

next-stage unit sorters positioned in the (+)X-direction of the unit sorter (Figures 18 & 32;

column 20, line 38 to column 21, line 49; column 24, lines 7-48; column 24, line 64 to 26, line

20; column 28, lines 1-23), and

128.   an N-input/N-output sorter network is configured on the whole by connecting

N/m*(N/m+1)/2 pieces of the unit sorters (Figures 18 & 32; column 20, line 38 to column 21,

line 49; column 24, lines 7-48; column 24, line 64 to 26, line 20; column 28, lines 1-23). See

MPEP 716.01(a) concerning (2N/m-1)* N/m.

129.   As per claim 31, Chao teaches a packet switch having a Virtual Output Queue

comprising:

130.   a request information management unit managing the number of scheduling requests and

holding forwarding request information on each input line as a scheduling target with respect to a

desired output line (Figures 7a [block 714], 7b [block 714'], 8 [block 810, 840], 10 [blocks 1010,

1020, 1030, 1040], 11, 12 [blocks 1250, 1260, 1262, 1270], 13 [block 1270'], 15 [block 1520],

16 [blocks 1630, 1640], 17, 20a, 20b, 28, 37a, 37b, 37c; column 7, lines 33-44; column 8, lines

10-47; column 10, lines 27-50; column 12, lines 38-51; column 17, lines 22-29);

131.   an inter-highway pointer control unit for holding an inter-highway pointer for indicating a

start-of-scheduling input line (Figures 10, 12, 13 [block 1270'], 19; column 12, lines 38-52;

column 15, line 65 to column 16, line 53; column 17, line 66 to column 18, line 60; column 21,

lines 49-65);

132.   an intra-highway pointer control unit for holding an intra-highway pointer for indicating a

start-of-retrieval output line in the forwarding request information corresponding to each input

line (Figures 10, 12, 15 [block 1520]; column 9, line 52 to column 10, line 27; column 16, lines

3-59);

133.   a request management control unit for holding forwarding request information to a

desired output line (Figures 10, 12, 15 [block 1520]; column 9, line 52 to column 10, line 27;

column 16, lines 3-59).

134.   Chao does not teach a scheduling processing unit for starting the retrieval of the output

lines from the output line indicated by the intra-highway pointer control unit from plural pieces

of the forwarding request information, and selecting the output line unselected by other input

lines,

135.   wherein the scheduling processing unit, after allocating the output line numbers to valid

cells coming from the respective input lines, allocates dummy output line numbers for idle cells

to the input lines to which the valid cells are not allocated, and transfers the output line numbers

of the cells coming from all the input lines with different values without any overlaps.

136.   Oba teaches a scheduling processing unit for starting the retrieval of the output lines from

the output line indicated by the intra-highway pointer control unit from plural pieces of the

forwarding request information, and selecting the output line unselected by other input lines,

(Figures 1 [block 16], 2 [block 16], 3, 4, 5a [block 16], 5b [block 16], 8a-d [block 16], 10 [blocks

11-1, 11-2, 11-N], 13; column 4, line 62 to column 6, line 53; column 7, line 49 to column 8, line

29; column 12, line 44 to column 13, line 25),

137.   wherein the scheduling processing unit, after allocating the output line numbers to valid

cells coming from the respective input lines, allocates dummy output line numbers for idle cells

to the input lines to which the valid cells are not allocated, and transfers the output line numbers

of the cells coming from all the input lines with different values without any overlaps (Figures 1

[block 16], 2 [block 16], 3, 4, 5a [block 16], 5b [block 16], 8a-d [block 16], 10 [blocks 11-1, 11-

2, 11-N], 13; column 4, line 62 to column 6, line 53; column 7, line 49 to column 8, line 29;

column 12, line 44 to column 13, line 25). It would have been obvious to one of ordinary skill in

the art at the time the invention was made to include the scheduling processing unit of Oba with

the system of Chao, as it would create a system in which all packets were dealt with fairly. One would be motivated to combine such a scheduling unit in the system of Chao as it would ensure that the use of bandwidth was being maximized as well as creating a method in which delivery was ensured via quality of service techniques as discussed both in Chao and Oba.

138. As per claim 32, Chao teaches a packet switch having a Virtual Output Queue comprising:

139. a request information management unit managing the number of scheduling requests and holding forwarding request information on each input line as a scheduling target with respect to a desired output line (Figures 7a [block 714], 7b [block 714'], 8 [block 810, 840], 10 [blocks 1010, 1020, 1030, 1040], 11, 12 [blocks 1250, 1260, 1262, 1270], 13 [block 1270'], 15 [block 1520], 16 [blocks 1630, 1640], 17, 20a, 20b, 28, 37a, 37b, 37c; column 7, lines 33-44; column 8, lines 10-47; column 10, lines 27-50; column 12, lines 38-51; column 17, lines 22-29);

140. a priority pointer control unit for indicating a start number of the priority patterns (Figure 33; column 31, lines 20-48; column 31, line 51 to column 32, line 52).

141. Chao does not teach a scheduling processing unit, having N-pieces (N is a natural number equal to or more than 2) of priority patterns with different selection priorities between the respective output lines, for selecting the output line unused by other input lines in accordance with the priority pattern and the forwarding request information (Figure 33; column 31, lines 20-48; column 31, line 51 to column 32, line 52); and,

142. wherein the scheduling processing unit, sequentially performing the scheduling for the N-patterns from the priority pattern indicated by a priority pointer, and updating the start number of

the priority patterns at a next scheduling cycle, simultaneously allocates the output line numbers

to the valid cells coming from the respective input lines and allocates dummy output line

numbers to idle cells by effecting contention control, and transfers the output line numbers of the

cells coming from all the input lines with different values without any overlaps.

143.   Oba teaches a scheduling processing unit, having N-pieces (N is a natural number equal

to or more than 2) of priority patterns with different selection priorities between the respective

output lines, for selecting the output line unused by other input lines in accordance with the

priority pattern and the forwarding request information (Figures 1 [block 16], 2 [block 16], 3, 4,

5a [block 16], 5b [block 16], 8a-d [block 16], 10 [blocks 11-1, 11-2, 11-N], 13; column 4, line 62

to column 6, line 53; column 7, line 49 to column 8, line 29; column 12, line 44 to column 13,

line 25); and,

144.   wherein the scheduling processing unit, sequentially performing the scheduling for the N-

patterns from the priority pattern indicated by a priority pointer, and updating the start number of

the priority patterns at a next scheduling cycle, simultaneously allocates the output line numbers

to the valid cells coming from the respective input lines and allocates dummy output line

numbers to idle cells by effecting contention control, and transfers the output line numbers of the

cells coming from all the input lines with different values without any overlaps (Figures 1 [block

16], 2 [block 16], 3, 4, 5a [block 16], 5b [block 16], 8a-d [block 16], 10 [blocks 11-1, 11-2, 11-

N], 13; column 4, line 62 to column 6, line 53; column 7, line 49 to column 8, line 29; column

12, line 44 to column 13, line 25). It would have been obvious to one of ordinary skill in the art

at the time the invention was made to include the scheduling processing unit of Oba with the

system of Chao, as it would create a system in which all packets were dealt with fairly. One

would be motivated to combine such a scheduling unit in the system of Chao as it would ensure

that the use of bandwidth was being maximized as well as creating a method in which delivery

was ensured via quality of service techniques as discussed both in Chao and Oba.

145.   Regarding claim 33, Chao teaches a packet switching method for a switch having a

Virtual Output Queue comprising the steps of:

146.   imparting a sequence number to a phase-synchronization-oriented cell transferred from

each input line (Figure 13 [blocks 1320, 1350, 1370], 36a, 36b, 36c; column 18, line 28 to

column 19, line 12; column 31, line 51 to column 32, line 33);

147.   sequentially incrementing the output line number (Figure 13 [blocks 1320, 1350, 1370],

36a, 36b, 36c; column 18, line 28 to column 19, line 12; column 31, line 51 to column 32, line

33);

148.   shifting the output line number at the same timing between the respective input lines

(Figure 13 [blocks 1320, 1350, 1370], 36a, 36b, 36c; column 18, line 28 to column 19, line 12;

column 31, line 51 to column 32, line 33); and,

149.   executing phase synchronization at a cell level by comparing a timing of receiving the

phase-synchronization-oriented cell with the sequence number at each lattice point on the switch

side (Figure 13 [blocks 1320, 1350, 1370], 36a, 36b, 36c; column 18, line 28 to column 19, line

12; column 31, line 51 to column 32, line 33).

150.   Chao does not teach in a scheduling process of updating an inter-highway pointer

indicating a start-of-scheduling input line to a next adjacent input line at every scheduling cycle,

and updating an intra-highway pointer indicating a start-of-retrieval output line to a line adjacent

to the line with the forwarding determined on the basis of forwarding request information corresponding to the input line.

151.   Oba teaches in a scheduling process of updating an inter-highway pointer indicating a start-of-scheduling input line to a next adjacent input line at every scheduling cycle, and updating an intra-highway pointer indicating a start-of-retrieval output line to a line adjacent to the line with the forwarding determined on the basis of forwarding request information corresponding to the input line (Figures 1 [block 16], 2 [block 16], 3, 4, 5a [block 16], 5b [block 16], 8a-d [block 16], 10 [blocks 11-1, 11-2, 11-N], 13; column 4, line 62 to column 6, line 53; column 7, line 1 to column 10, line 3). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the scheduling processing unit of Oba with the system of Chao, as it would create a system in which all packets were dealt with fairly. One would be motivated to combine such a scheduling unit in the system of Chao as it would ensure that the use of bandwidth was being maximized as well as creating a method in which delivery was ensured via quality of service techniques as discussed both in Chao and Oba.

152.   As per claim 34, Chao teaches a packet switching method for a switch having a Virtual Output Queue comprising the steps of:

153.   transferring in broadcast the cells given the sequence numbers to respective lattice points within the switch from the respective input lines (Figure 13 [blocks 1320, 1350, 1370], 36a, 36b, 36c; column 18, line 28 to column 19, line 12; column 31, line 51 to column 32, line 33); and,

154.   executing phase synchronization at a cell level by comparing the sequence numbers of

the arrived cells at the lattice points within the switch (Figure 13 [blocks 1320, 1350, 1370], 36a,

36b, 36c; column 18, line 28 to column 19, line 12; column 31, line 51 to column 32, line 33).

155.   Chao does not teach a scheduling process of updating an inter-highway pointer indicating

a start-of-scheduling input line to a next adjacent input line at every scheduling cycle, and

updating an intra-highway point indicating a start-of-retrieval output line to a line adjacent to the

line with the forwarding determined on the basis of forwarding request information

corresponding to the input line.

156.   Oba teaches in a scheduling process of updating an inter-highway pointer indicating a

start-of-scheduling input line to a next adjacent input line at every scheduling cycle, and

updating an intra-highway point indicating a start-of-retrieval output line to a line adjacent to the

line with the forwarding determined on the basis of forwarding request information

corresponding to the input line (Figures 1 [block 16], 2 [block 16], 3, 4, 5a [block 16], 5b [block

16], 8a-d [block 16], 10 [blocks 11-1, 11-2, 11-N], 13; column 4, line 62 to column 6, line 53;

column 7, line 1 to column 10, line 3). Therefore it would have been obvious to one of ordinary

skill in the art at the time the invention was made to include the scheduling processing unit of

Oba with the system of Chao, as it would create a system in which all packets were dealt with

fairly. One would be motivated to combine such a scheduling unit in the system of Chao as it

would ensure that the use of bandwidth was being maximized as well as creating a method in

which delivery was ensured via quality of service techniques as discussed both in Chao and Oba.

157.   With regards to claim 35, Chao teaches a packet switching method for a switch having a

Virtual Output Queue comprising the steps of:

158.   transferring the cells to the respective lattice points within the switch from the input lines

(Figure 13 [blocks 1320, 1350, 1370], 36a, 36b, 36c; column 18, line 28 to column 19, line 12;

column 31, line 51 to column 32, line 33); and,

159.   adjusting a phase difference at a cell level by a phase adjustment buffer provided at each

lattice point (Figure 13 [blocks 1320, 1350, 1370], 36a, 36b, 36c; column 18, line 28 to column

19, line 12; column 31, line 51 to column 32, line 33).

160.   Chao does not teach in a scheduling process of updating an inter-highway pointer

indicating a start-of-scheduling input line to a net adjacent input line at every scheduling cycle,

and updating an intra-highway pointer indicating a start-of-retrieval output line to a line adjacent

to the line with the forwarding determined on the basis of forwarding request information

corresponding to the input lines.

161.   Oba teaches in a scheduling process of updating an inter-highway pointer indicating a

start-of-scheduling input line to a net adjacent input line at every scheduling cycle, and updating

an intra-highway pointer indicating a start-of-retrieval output line to a line adjacent to the line

with the forwarding determined on the basis of forwarding request information corresponding to

the input lines (Figures 1 [block 16], 2 [block 16], 3, 4, 5a [block 16], 5b [block 16], 8a-d [block

16], 10 [blocks 11-1, 11-2, 11-N], 13; column 4, line 62 to column 6, line 53; column 7, line 1 to

column 10, line 3). Therefore it would have been obvious to one of ordinary skill in the art at the

time the invention was made to include the scheduling processing unit of Oba with the system of

Chao, as it would create a system in which all packets were dealt with fairly. One would be

motivated to combine such a scheduling unit in the system of Chao as it would ensure that the

use of bandwidth was being maximized as well as creating a method in which delivery was

ensured via quality of service techniques as discussed both in Chao and Oba.

162.   Regarding claim 36, Chao teaches wherein the scheduling processing unit includes:

163.   means for dividing, when selecting the forwarding request information corresponding to

each line as a scheduling target, the forwarding request information into two pieces of

information before and after the intra-highway pointer, and obtaining the lines having lowest

numbers based on a low number selection logic from those pieces of information (Figures 10, 11,

13 [block 1320, 1330, 1350]; column 18, lines 27-60); and,

164.   means for obtaining a final forwarding line number from the obtained two lower number

lines with a priority given to a result after the intra-highway pointer (Figure 33; column 31, lines

20-48; column 31, line 51 to column 32, line 52).

165.   Regarding claim 37, Chao teaches wherein a plurality of the scheduling processing units

are provided, and the scheduling control system further comprises pipeline processing means for

each independently executing a pipeline process (Figure 13 [block 1320, 1330, 1350]; column

18, lines 27-60).

166.   Regarding claim 38, Chao does not teach wherein the scheduling processing unit gives a

forwarding right to the forwarding request in an arbitrary off-band QoS class if unable to obtain

the forwarding right in any QoS classes under the band control.

167.   Oba teaches wherein the scheduling processing unit gives a forwarding right to the

forwarding request in an arbitrary off-band QoS class if unable to obtain the forwarding right in

any QoS classes under the band control (Figures 7, 8A, 8B, 8C, & 8D; column 11, line 22 to

column 12, line 3;column 12, line 44 to column 13, line 25).

168.   Regarding claim 39, Chao does not teach wherein the scheduling processing unit applies

a random array of inverted LSB/MSB of binary notation permutation layout patterns as the above

priority patterns.

169.   Oba teaches wherein the scheduling processing unit applies a random array of inverted

LSB/MSB of binary notation permutation layout patterns as the above priority patterns (Figures

7, 8A, 8B, 8C, & 8D; column 11, line 22 to column 12, line 3; column 12, line 44 to column 13,

line 25). It would have been obvious to one of ordinary skill of the art at the time the invention

was made to invert the binary notation of Oba as simply reversing or rearranging parts. See *In re

Japikse*, 181 F.2d 1019, 1023, 86 USPQ 70, 73 (CCPA 1950).

170.   As per claim 40, Chao teaches a scheduling control system for a switch having a Virtual

Output Queue comprising:

171.   a request information management unit holding forwarding request information for each

input line as a scheduling target with respect to a desired output line (Figures 7a [block 714], 7b

[block 714'], 8 [block 810, 840], 10 [blocks 1010, 1020, 1030, 1040], 11, 12 [blocks 1250, 1260,

1262, 1270], 13 [block 1270'], 15 [block 1520], 16 [blocks 1630, 1640], 17, 20a, 20b, 28, 37a,

37b, 37c; column 7, lines 33-44; column 8, lines 10-47; column 10, lines 27-50; column 12, lines 38-51; column 17, lines 22-29);

172.   an inter-highway pointer control unit for indicating a start-of-scheduling input line for a scheduling cycle (Figures 8, 9, 10 [blocks 1010, 1020, 1030, 1040], 11, 16 [blocks 1630, 1640], 17, 28, 33, 35a, 35b, 35c, 35d, 35e, 37c; column 8, line 48 to column 9, line 51; column 10, line 52 to column 11, line 47; column 16, lines 3-59; column 19, line 17 to column 20, line 20);

173.   an intra-highway point control unit for indicating, for each input line, a start-of-retrieval output line in the forwarding request information (Figures 8, 9, 10 [blocks 1010, 1020, 1030, 1040], 11, 16 [blocks 1630, 1640], 17, 28, 33, 35a, 35b, 35c, 35d, 35e, 37c; column 8, line 48 to column 9, line 51; column 10, line 52 to column 11, line 47; column 16, lines 3-59; column 19, line 17 to column 20, line 20).

174.   Chao does not teach a scheduling processing unit for starting the scheduling cycle according to the start-of-scheduling input line and retrieving output lines, for each input line, starting from the start-of-retrieval output line, the scheduling processing unit scheduling output lines based upon the forwarding request information for each input line and selecting the output line unselected by other input lines, performing the scheduling for all the input lines in sequence, and updating each start-of-retrieval output line indicated by the intra-highway pointer control unit at a next scheduling cycle.

175.   Oba teaches a scheduling processing unit for starting the scheduling cycle according to the start-of-scheduling input line and retrieving output lines, for each input line, starting from the start-of-retrieval output line, the scheduling processing unit scheduling output lines based upon the forwarding request information for each input line and selecting the output line unselected by

other input lines, performing the scheduling for all the input lines in sequence, and updating each

start-of-retrieval output line indicated by the intra-highway pointer control unit at a next

scheduling cycle (Figures 1 [block 16], 2 [block 16], 3, 4, 5a [block 16], 5b [block 16], 8a-d

[block 16], 10 [blocks 11-1, 11-2, 11-N], 13; column 4, line 62 to column 6, line 53; column 7,

line 49 to column 8, line 29; column 12, line 44 to column 13, line 25). It would have been

obvious to one of ordinary skill in the art at the time the invention was made to include the

scheduling processing unit of Oba with the system of Chao, as it would create a system in which

all packets were dealt with fairly. One would be motivated to combine such a scheduling unit in

the system of Chao as it would ensure that the use of bandwidth was being maximized as well as

creating a method in which delivery was ensured via quality of service techniques as discussed

both in Chao and Oba.

Conclusion

176.   Applicant's amendment necessitated the new ground(s) of rejection presented in this

Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

177.   A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

178. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christian La Forgia whose telephone number is (703) 305-7704. The examiner can normally be reached on Monday thru Thursday 7-5.

179. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ayaz Sheikh can be reached on (703) 305-9648. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 746-7240 for regular communications and (703) 746-7239 for After Final communications.

180. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

<div align="right">
Christian LaForgia
Patent Examiner
Art Unit 2155
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clf
May 27, 2003

<div align="right">
AYAZ SHEIKH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100
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